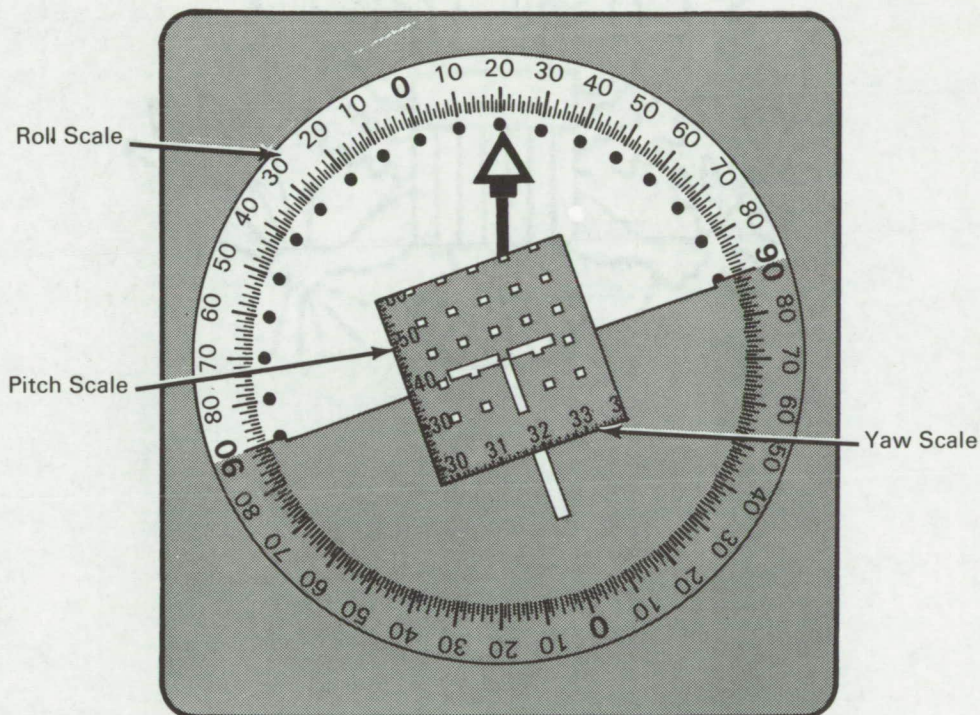


# NASA TECH BRIEF



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## Developmental Instrument Supplies Accurate Attitude and Attitude-Rate Data



### The problem:

To provide accuracy of readout of both attitude and attitude-rate information in an easily interpreted, uncluttered arrangement where blind navigation of a moving body is involved. The "All Attitude Ball" (now 24 years old) that gives a spherical presentation, suffers a bit from the fact that its longitudinal length (yaw) scale indication declines with changes with latitude (pitch).

### The solution:

A three orthogonal-plane projection in which the longitudinal length is constant, and therefore independent of the pitch and roll attitudes of the moving body. The configuration is quite similar to the outer framework of a child's spinning gyroscope top.

### How it's done:

Three tapes, orthogonally mounted, are installed on drive members behind a back-lighted display plate.

(continued overleaf)

The tapes are divided into scale increments that indicate the degrees of roll, pitch, and yaw, respectively, being experienced by the moving body. This reference attitude indicator is a repeater type of display that uses transducers as rate gyros to operate synchronous motors to drive the scaled tapes in response to changes in attitude of the moving body.

**Notes:**

1. Slewing speed in all three axes is 90° per second. Static accuracies of indication in all three axes are better than one arc degree, indicated. Sensitivity to rates of change is in the order of 0.01 degree of arc per second.
2. The pitch and yaw servos have a velocity constant of 97, while that of the roll servo is 55. Servo bandwidth is about 6 cps for pitch and yaw, and 5 cps for roll.

3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Headquarters  
National Aeronautics and Space  
Administration  
Washington, D.C. 20546.  
Reference: B66-10607

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Bolt, Beranek, and Newman, Inc.  
under contract to NASA  
(HQ-57)